

REMARKS/ARGUMENTS

Prior to this Amendment, claims 1-51 (after renumbering of misnumbered claims 50-52 to 49-51) were pending for consideration in this application.

Claim 1 is amended to include the limitations of dependent claims 2 and 11 (which are canceled). As amended, the system of claim 1 calls network-accessible devices configured for managing storage of data across a plurality of network-accessible devices with RAID-type distribution. Claim 52, which depends from claim 1, is added to stress that such a RAID-type distribution allows redundancy operations to be managed over the network rather than at a node. Claim 53, which depends from claim 1, is added to stress specific RAID-type distribution functions may be performed by the claimed system. The cited art fails to show a RAID-type distribution of data over a network. No new matter is added with support found at least in the original claims and at page 13, lines 12-16 and at page 26, col. 12 to page 27, line 15.

Independent claim 21 is amended to include the limitations of dependent claims 22 and 25 (which are canceled) to clarify that the claimed method comprises "communicating state information between the plurality of storage devices," and it is believed that this act is not shown by the cited art. New claim 54 is added to specify what types of state information may be passed between the plurality of network-accessible devices. No new matter is added with support being found in the original claims and in Figure 6 and associated portions of Applicants' specification.

Claims 29-32 are canceled.

Independent claim 33 is amended to include the limitations of dependent claim 38, which is canceled. As amended, claim 33 calls for stored parity data to be used to verify the correctness of retrieved data and when an error is detected, to use the parity data to retrieve a correct version of the data.

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Independent claim 42 is amended to include monitoring of the plurality of network accessible storage devices including transmitting heartbeat messages from at least a portion of the devices. No new matter is added by this amendment with support found at page 18, lines 4-24 of Applicants' specification.

Independent claim 44 is amended to include the limitations of dependent claim 47 (which is canceled) to emphasize that the method includes migrating data amongst the storage devices in a preemptive manner, which is not shown by the art of record. No new matter is added with support being found at least in the originally filed claim 47.

Claims 1, 3-10, 12-21, 23, 24, 26-28, 33-37, 39-46, and 48-54 remain in the application for consideration by the Examiner.

Claim Objections

In the Office Action, several objections were made to the claims.

Claims 50-52 were misnumbered because no claim 49 was originally filed. Claims 50-52 are renumbered as claims 49-51 to match actions already taken by the Examiner.

Claim 9 was objected to due to the use of "Fibre" instead of "Fiber", but since "Fibre Channel" is the common terminology, claim 9 was not amended.

Claims 39, 41, 46, and 47 were objected to due to minor informalities. Claim 47 is canceled, and claims 39, 41, and 46 are amended to address these typographical errors.

Rejections under 35 U.S.C. 112

The Office Action rejected claims 13, 33, 35, 38-40, and 44 under 35 U.S.C. 112, second paragraph as being indefinite due to antecedent basis issues. Claims 13, 33, 35, 39-40, and 44 (as well as claim 12) have been amended to provide proper antecedent basis in the pending claims. Claim 38 is canceled.

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Rejections under 35 U.S.C. 102

In the Office Action dated May 17, 2004, claims 1-28 and 42-50 were rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Pat. No. 5,987,506 ("Carter"). The rejection of the pending claims is respectfully traversed based on the following remarks.

Claim 1 calls for a data storage management system comprising a plurality of network-accessible devices capable of storing data and a plurality of network-accessible devices configured to implement storage management processes. The processes for storing data "comprise processes that implement a RAID-type distribution across the plurality of network-accessible devices." Carter fails to show storing data across a plurality of network-accessible devices by implementing a RAID-type distribution. Hence, all the elements of claim 1 are not shown by Carter, and claim 1 is believed allowable over this reference.

More particularly, the Office Action cites Carter at col. 8, lines 42-50 (with reference to now canceled claim 11) as showing implementing a RAID-type distribution across a plurality of network-accessible devices. Carter only mentions RAID in passing at col. 16, line 45 when it teaches that one of its storage devices may comprise a RAID. At the citation given in the Office Action, Carter teaches that data may be managed for coherency and with redundancy but does not teach that such techniques would include a "RAID-type distribution" across a plurality of network-accessible devices. Instead, at col. 23, lines 12-27 and elsewhere, Carter teaches that a "coherent replication controller" may provide some protection against failure of a device by generating a copy of the data for storage on a second device. This does not teach "RAID-type distribution" across a plurality of nodes.

Storing of data according to the invention using RAID-type distribution is further emphasized in new claim 52 that calls for the RAID-type distribution to include managing redundancy operations across the nodes rather than at a node. Carter teaches providing a backup copy at a device that requests data (see Figure 7 and associated text) but fails to teach managing redundancy

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across a plurality of nodes. Claim 53 further calls for the RAID-type distribution to include a number of functionalities, such as data mirroring across the network-accessible devices, that are not shown by Carter. Hence, claims 1, 52, and 53 are not anticipated by Carter because Carter fails to teach "RAID-type distribution" of stored data across a plurality of network-accessible devices.

Claims 3-10 and 12-20 depend from claim 1 and are believed allowable as depending from an allowable base claim. Further, claim 12 calls for the processes for storing data to comprise "processes that implement an n-dimensional parity scheme for data elements across the plurality of network-accessible devices." Claim 13 calls for a size of the parity scheme to be expanded or contracted as part of the process for storing data. Carter fails to teach the use of a parity scheme at all let alone one that is expandable and contractable. The Office Action cites col. 8, lines 39-50 for teaching such a parity scheme, but at this citation, Carter merely mentions replicating data and maintaining data coherence. There is no teaching of a parity scheme as would be implemented in a RAID-type distribution as called for in claim 12. In rejecting claim 13, the Office Action merely states that it is "inherent" to alter the size of the parity scheme. Applicants disagree with this construction as parity schemes can be provided with a single dimension without allowing expansion or contraction. For these additional reasons, claims 12 and 13 (and claims 14 and 15 which depend from claim 12) are believed allowable over Carter.

Independent claim 21 is directed to a method of data storage management and calls for providing a plurality of network-accessible storage devices and "communicating state information between the plurality of storage devices." Carter fails to teach communicating such information between its devices. With reference to now canceled claim 25, the Office Action cites Carter at col. 13, lines 19-58, but Carter is discussing locking a file and only providing access to such a file when the "state of the lock data structure" changes. There is no teaching of passing state information relating to the network-accessible storage devices among the devices. In other words, passing the lock value of a

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secure file in response to a read or write request does not provide an operational state definition to the requesting device but only describes the particular file without providing the context or state of the device storing the requested file. New claim 54 is added to further define what types of information may be included in the passed state information, and Carter fails to teach the exchange of any of these types of state information. Hence, claims 21 and 54 are not anticipated by Carter, and Applicants request that this rejection be withdrawn.

Claims 23, 24, and 26-28 depend from claim 21 and are believed allowable at least for the reasons for allowing claim 21. Further, claims 24 and 26 call for the storing of data to comprise storing the data in a "RAID-like fashion" and "using a RAID-type distribution", and therefore, claims 24 and 26 are believed allowable for the reasons provided for allowing claim 1. Claim 27 calls for the storing of data to involve storing parity and/or mirror data across the devices, and as discussed with reference to claims 12 and 53, Carter fails to teach storing of data across network nodes using parity data and also mirroring. For these additional reasons, claims 24, 26, and 27 are allowable over Carter.

Independent claim 42 is directed to a method for data storage management that calls for providing a plurality of network accessible storage devices. The method further calls for "monitoring the data storage for faults" with storage management processes by having at least a portion of the plurality of network accessible storage devices transmitting heartbeat messages. Carter fails to teach monitoring of network devices making up a distributed data storage network using heartbeat messages from the network devices. The Office Action cites Carter at col. 23, lines 12-27, but at this citation, Carter discusses how by providing a backup copy of an original that a system can provide "fault tolerant operation." Carter does not teach monitoring the devices and certainly, does not teach having at least a portion of the network devices transmitting heartbeat messages which can be processed by storage management processes in managing data storage operations across the network devices. Hence, claim 42 and claim 43, which depends from claim 42, are not anticipated by Carter.

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Independent claim 44 is directed to another method for data storage management that includes providing a plurality of network-accessible storage devices, but in this method, storage management processes are configured to migrate data amongst the storage devices. Interestingly, storage messages are used "preemptively when a fault condition in at least one of the storage devices is determined to be likely." Carter fails to teach determining when a fault condition is likely and preemptively migrating stored data amongst network devices. The Office Action, in rejecting claim 47, cited Carter at col. 23, lines 12-27, but as discussed above, Carter is merely teaches "a coherence migration process" can be used but fails to teach determining when a fault is "likely" and "preemptively" using storage messages to migrate data amongst network-accessible storage devices. Hence, claim 44 is not anticipated by Carter, and this rejection should be withdrawn.

Claims 45, 46, and 48-50 depend from claim 44 and are believed allowable for at least the reasons provided for allowing claim 44. Further, claim 49 calls for associating parity information with a data set, storing the parity information, and serving data requests using the parity data. As discussed with reference to claim 12, Carter provides no teaching relevant to the use of parity data and clearly, does not teach the specific limitations of claim 49. For this additional reason, claim 49 is allowable over Carter.

Rejections under 35 U.S.C. 103

Additionally, in the Office Action, claims 29-41 were rejected under 35 U.S.C. 103(a) as being unpatentable over Carter in view of U.S. Pat. No. 6,122,754 ("Litwin"). Claims 29-32 and 38 are canceled. The rejection of claims 33-37 and 39-41 is respectfully traversed based on the following remarks.

Independent claim 33 calls for a data storage management method similar to that of claim 21 that further calls for determining parity data for the data to be stored, storing the parity data across two or more devices, retrieving the data, verifying the correctness of the data with the parity data, and when an error is detected, using the parity data to retrieve a correct version of the data. The

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Office Action admits that Carter fails to provide any teaching of the use of parity data. Litwin is cited at col. 3, 18-26 for verifying correctness of data with parity data and when necessary, retrieving a correct version using the parity data. However, Litwin states that a "failure of a data bucket...are determined" without teaching that data is retrieved from one or more network devices and then this data is verified as correct using the parity data. As a result, Litwin fails to teach or suggest each and every element of claim 33 and the rejection should be withdrawn.

Claims 34-37 and 39-41 depend from claim 33 and are believed allowable at least for the reasons provided for allowing claim 33.

Additionally, in the Office Action, claim 51 was rejected under 103(a) as being unpatentable over Carter in view of U.S. Pat. No. 5,794,254 ("McClain"). Claim 51 depends from claim 44 and is believed allowable as depending from an allowable base claim. McClain does not overcome the deficiencies in Carter discussed above with reference to claim 44, and hence, claim 51 is believed in condition for allowance.

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Conclusions

The references made of record in the Office Action but not relied upon are believed to be no more relevant than Carter, Litwin, and McClain, and the pending claims are believed allowable over these additional references.

In view of all of the above, the pending claims are now believed to be allowable and the case in condition for allowance. Applicants respectfully request that a timely Notice of Allowance be issued in this case.

No fee is believed due with this Amendment, but any fee deficiency associated with this submittal may be charged to Deposit Account No. 50-1123.

Respectfully submitted,

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